PROJECT FACT SHEET

CONTRACT TITLE: Laboratory Modeling and Field Development of Borehole Seismic Imaging Techniques Using Wave Field Measurements.

DATE REVISED: December 14, 1989

OBJECTIVE: The objective of this work is to develop processing, imaging, and interpretation techniques for the use of crosswell seismic data in order to acquire a higher resolution image of the hydrocarbon bearing formation to aid the extraction process.

CONTRACT NO: DE-AC19-89BC14478
CONTRACT AMT:
B AND R CODE:AC0520050

CONTRACTOR:
Colorado School of Mines
ADDRESS: Golden, CO 80401

CONTRACT PERFORMANCE PERIOD:
09/1/89 TO 08/30/92
PROJECT BEGINNING: 09/89

CONTRACT PROJECT MANAGER:
NAME: Dr. Alfred H. Balch
ADDR: Dept. of Geophysics
Colorado School of Mines
Golden, Co. 80401
PHONE: (303)273-3477

DOE PROGRAM MANAGER:
NAME: Marvin Brooks
FTS: 233-4462
COMMERCIAL NO:(301)353-4462

DOE PROJECT MANAGER:
NAME: Robert E. Lemmon
LOCATION - BPO
FTS: 745-4405
COMMERCIAL NO:(918)337-4405

PROJECT SITE:
Golden, CO 80401

SCHEDULE MILESTONES:

Physical laboratory modeling; a) Fabricate the models. b) Perform the acoustic measurements. c) Process model data - modify or write new software. d) Complete a topical report. - 18 months duration.

Field experiment at the CSM Experimental Mine; a) Acquire and b) Process three-component cross-borehole seismic data. - 12 months duration, ending 24 months from initiation of contract.

Field experimental work at well site; a) Acquire and b)Process three-component borehole data at a well site in the Denver-Jilesberg Basin. - 12 months duration, ending 36 months from initiation of contract.

CONTR.	FUNDING (1,000'S)	DOE	OTHER	CONTR.	TOTAL
	PRIOR FISCAL YRS	0	0		0
	FISCAL YR '90	160	0		160
	FUTURE FUNDS	269	0		269
	TOTAL EST'D FUNDS	429	0	0	429

PROJECT DESCRIPTION:

This proposal is directed at the development of processing, imaging, and interpretation of borehole seismic data. A key element in the proposal is the use of physical acoustic laboratory scale models to generate digitized model cross-borehole data. These digitized data would be very realistic and contain compressional, shear converted and tube wave modes. These data are easily obtained, and are better data than field acquired data for algorithm development because the model from which the data came is known exactly. Reverse time migration is the imaging technique proposed because of its proven efficiency in other applications. After the techniques are developed on known models it is proposed that they be tested using field data. The first test would used shallow hole data near known tunnels, drifts, and other known subsurface features at the CSM Experimental Mine. The second test would use production wells in an oil reservoir.

PRESENT STATUS: Contract signed 25 September 1989.

ACCOMPLISHMENTS: None available as this is a new project.

BACKGROUND:

One of the most important elements in increasing the predictability of oil and gas recovery, and improving the recovery itself, is a detailed geologic knowledge of the reservoir, and the surrounding sediments. Efforts to understand the production process can only be successful if the effort is made within the context of knowledge of the reservoir itself. This includes knowledge of the location, character, and extent of the reservoir, and knowledge of the media through which the petroleum and natural gas will flow during production.

Borehole seismology - the process of energizing a seismic source in a borehole and measuring the resulting wave field in an adjacent borehole, or at another location in the source borehole - is one of the most promising techniques for obtaining detailed, high-resolution subsurface geologic information. The technique requires significant development before it can be used routinely as an investigative method. Sufficient hardware has been developed to generate data for research purposes. Data taken with this hardware has pointed up the need for processing and interpretation.

Progress in borehole seismic data interpretation has been exceedingly slow because the investigator has no means of determining the accuracy of his interpretation, ie., he rarely if ever knows with certainty what the correct reservoir geology is; the observed seismic wave field is extremely complex, which makes processing and interpretation most difficult; and it is difficult, time consuming, and expensive with present hardware to obtain good quality field borehole seismic data with which to work. Addressing these factors has led to this proposal.